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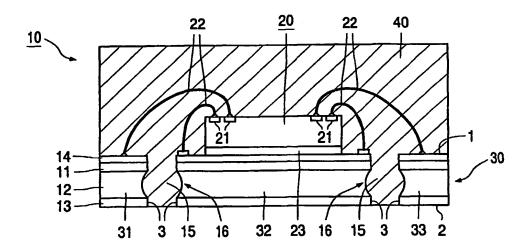
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(54) Title: SEMICONDUCTOR DEVICE AND METHOD OF MANUFACTURING SAME



(57) Abstract: The semiconductor device (10) comprises a carrier (30) and a semiconductor element (20), such as an integrated circuit. The carrier (30) is provided with apertures (15), thereby defining connecting conductors (31-33) having side faces (3). Notches (16) are present in the side faces (3). The semiconductor element (20) is enclosed in an encapsulation (40) that extends into the notches (16) in the carrier (30). As a result, the encapsulation (40) is mechanically anchored in the carrier (30). The semiconductor device (10) can be made in a process wherein, after the encapsulating step, no lithographic steps are necessary.

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Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Х	US 2001 049156 A1 (JUNG KYUJIN ET AL) 6 December 2001 (2001-12-06)	1-3,7, 10,11
A	the whole document	5,9,12
X	EP 1 187 205 A (SANYO ELECTRIC CO) 13 March 2002 (2002-03-13) the whole document	1-5,7,10
X	EP 1 143 509 A (SANYO ELECTRIC CO)	1,3,4
A	10 October 2001 (2001-10-10) the whole document	7,10-12
X	PATENT ABSTRACTS OF JAPAN vol. 0090, no. 69 (E-305), 29 March 1985 (1985-03-29) & JP 59 208756 A (SONY KK),	1
A	27 November 1984 (1984-11-27) abstract; figures 2,4 -/	7,10,11

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	on) DOCUMENTS CONSIDERED TO BE RELEVANT  itation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
category * C	mation of document, with indication, where appropriate, or the reason passages	
	-& JP 59 208756 A (SONY KK) 27 November 1984 (1984-11-27)	
A	US 6 306 685 B1 (LIU P C ET AL) 23 October 2001 (2001-10-23) the whole document	1,7,10
A	EP 1 182 703 A (CASIO COMP CO LTD; INTEGRATED ELECTRONICS & PACKA (JP)) 27 February 2002 (2002-02-27) the whole document	6
		•

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## INTERNATIONAL ARCH REPORT

PCT/IB 03/01421

				l .	
Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 2001049156	A1	06-12-2001	US	6261864 E	17-07-20
 EP 1187205	Α	13-03-2002	JP	2002083903 A	
			CN	1341963 <i>F</i>	•
			EΡ	1187205 <i>F</i>	
			US	2002048828	1 25-04-20
EP 1143509	A	10-10-2001	JP	2001250883	14-09-20
2. 22.10003	•••		JP	2001250884	14-09-20
			CN	1315823 /	03-10-20
		. · ·	EΡ	1143509	10-10-20
	,	y-	US	6562660	31 13-05-20
JP 59208756	Α	27-11-1984	 JР	1760995 (	20-05-19
0, 33230, 30	•	<b></b>	JP	4047977	3 05-08-19
US 6306685	B1	23-10-2001	NONE		
EP 1182703	Α	27-02-2002	JP	2002057291	
			JР	2002057292	•
			CN	1338779	A 06-03-20
			ΕP	1182703	42 27-02-20
			US	2002017730	A1 14-02-20

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